Space Weather Forecast

Issued on Friday, 01 December 2023 at 01:18 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of Moderate flares (R1-R2 Blackouts). G1-G2 Minor to Moderate storms expected, with a chance of Strong storms due to multiple coronal mass ejection arrivals today.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low, with only Common class flares, the largest of which from a region just behind the southwest limb. There are currently eleven sunspot regions with the largest, and previously the most active a moderately sized region in the southwest quadrant which is comprised of a cluster of spots. The region has moderate magnetic complexity. All other regions on the disc remain smaller and simpler, and generally either stable or showing signs of decay. However, the second largest Common-class flare of the 24 hour period originated not from the largest region on the disc, but from one of these smaller regions in the northwest quadrant. A number of filaments, lines of material held together by the magnetic field, currently lie on the Earth facing side of the Sun and can erupt to produce coronal mass ejections (CMEs).
No Earth-directed CMEs occurred during this period, however there are a number of other potentially Earthbound CMEs in the forecast from previous days.

Solar Wind / Geomagnetic Activity: The solar wind speeds remained at Background levels for most of the day. with speeds around 350-400 km/s, but late evening the speed jumped to Slightly Elevated levels, reaching 450 km/s, At the same time the. Interplanetary Magnetic Field (IMF) jumped from previously weak values to become moderate. The north-south component also showed a drop in its values, become negative (southward orientated) having previously weakly fluctuated. These solar wind parameter indicate the arrival of a weak CME, most likely from a filament eruption late on the 27th. Geomagnetic activity was Quiet.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) persisted at background with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate with a chance of isolated Moderate flares (R1-R2 Blackout), and a slight chance of an isolated Strong class flare (R3 Blackout). The moderately sized sunspot in the southwest of the disc is most likely to be the source.

Solar Winds / Geomagnetic Activity: There are two further Earth-directed CMEs expected; one originates from a filament eruption during the morning of the 28th and the other, a more significant CME, from the Moderate class flare later on the 28th Nov. The Moderate flare sourced CME is forecast to arrive today (1st) around 1100 UTC, although the speed of this CME is low confidence. This CME is also likely to sweep up and cannibalise the other CME, which was forecast to arrive later today, potentially enhancing the impact when this occurs. Aside from the CME's current Slightly Elevated to Background winds are forecast to continue, until late in

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the period when a solar wind enhancement from a coronal hole feature is due to arrive, bringing Elevated winds of around 500-550 km/s.

Geomagnetic activity is initially expected to be Active to Minor Storm due to the weak arrival of the CME from the 27th. The CME arrivals are then likely to bring spells of Minor or Moderate geomagnetic storms today and tomorrow (1st and 2nd Dec) with a chance of Strong storms. Geomagnetic activity then gradually eases to Quiet to Unsettled levels for day 3 and part of day 4 (3rd and 4th Dec). Late day 4 activity is expected to increase Active to Minor Storm (Kp 4-5) due to the arrival of the solar wind enhancement.

This activity brings a chance of visible aurora to parts of the UK today and to a lesser extend tomorrow (1st and 2nd Dec). However, the strongest activity is currently expected to occur during daylight hours, although there is a chance of views of the aurora as far south as northern England, Wales and Northern Ireland given good views of the northern horizon early into the coming night.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to stay at background. However, any significant flares from the large spot will bring a chance of flux levels increasing, with a slight chance of approaching or perhaps exceeding the S1 Minor Radiation Storm level.

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Met Office Space Weather Forecast

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	80	60	10	50
Strong	G3	No	40	10	1	1
Severe	G4	No	5	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	40	40	40	40
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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